A Study on the Genus "Parapachydiscus," HYATT. *60*.

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(Rec. March 17, 1926. Comm. by Hisakatsu Yabe, M.I.A., April 12, 1926.)

Ammonites belonging to the genus Parapachydiscus, Hyatt, are common in the Pachydiscus-Beds of Hokkaidô and Saghalien (Senonian in age); among the ammonites already reported from the Cretaceous of Hokkaidô by Messrs. M. Yokoyama, K. Jimbo and our two, the following ten species are duely referable to Parapachydiscus: P. ariyalurensis Stol., P. naumanni Yok., P. sutneri Yok., P. abeshinaiensis Yabe (Ms. nom. = P. denisonianus of Jimbo, non Stoliczka), P. haradai Jimbo (juvenile specimen: P. yokoyamai Jimbo), P. teshioensis Jimbo, P. subtililobatus Jimbo, P. koluturensis Stol., P. fascicostatus Yabe and P. rotalinoides Yabe. The collections of the Geological Institute, Tôkyô Imperial University, and the Institute of Geology and Palaeontology, Tôhoku Imperial University, contain several other species of this genus derived from the two islands, Hokkaidô, and Saghalien, most of which are apparently new; but for the present purpose, it is necessary to refer to only four of these forms, P. menu Forbes, P. kossmati Yabe, P. karafutoensis Yabe and Shimizu, and P. mamiyai Yabe and Shimizu.

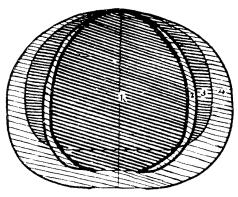
The species of Parapachydiscus enumerated above, are found to be classified into the following six groups:

- Group of P. gollevillensis.
 - (P. gollevillensis D'Orb., the type, not represented in our materials);
 - P. karafutoensis YABE and SHIMIZU.
- 2. Group of P. kossmati.
 - P. kossmati YABE (the type). Group of P. haradai.

3.

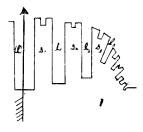
- P. haradai Jimbo (the type), P. teshioensis Jimbo.
- Group of P. fascicostatus.
- P. fascicostatus Yabe (the type), P.koluturensis Stol. (?), P. sutneri Yok. (?).
- 5. Group of P. naumanni.
- P. naumanni Yok. (the type), P. ariyalurensis Stol., P. subtililobatus Jimbo.

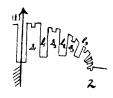
- 6. Group of P. mamiyai.
- 7. Group of P. menu.



The Cross-section of whorl:

- 1. Pseudopachydiscus kossmati (YABE)
- 2. Epipachydiscus mamiyai Yabe and Shim zu.
- 3. Mesopachydiscus haradai (JIMBO)
- 4. Neopachydiscus naumanni (Yoyo-YAMA) var. kowariyowaensis YABE and Shimizu 23







Diagramatic figures of the internal suture-line:

- Pseudopachydiscus kossmati (YABE)
 Mesopachydiscus haradai (JIMBO)
- 3. Neopachydiscus naumanni (Yoko-Yama) vor. kowariyowaensis Yabe and Shimizu.

- P. mamiyai (the type), P. abeshinaiensis Yabe (?).
- P. menu Forbes (the type), P. rotalinoides Yabe.

The distinctive features of these groups are as follows:

1. Group of P. gollevillensis.....

Parapachydiscus, Hyatt (s. s.)

Shell discoidal, compressed, with flattened sides; aperture elliptical longitudinally, with umbilicus moderately broad or rather narrow; surface with numerous round ribs curved forwards on venter; ribs of two kinds, longer one being tuberculated on umbilical border, sometimes provided with a deep groove in front, and alternated with several shorter ones without tubercle. Suture-lines: $L_1^{1)}$ conspicuously longer than (L), l_1 and l_2 erect, l_3 and later ones oblique and gradually decreasing depth.

2. Group of P. kossmati.....Pseudopachydiscus, nov.

Shell like the preceding type in form and sculpture, but provided with broader umbilicus. Suture-lines: S_1 broader than S_2 , L_1 narrow and nearly equal to (L) in length; l_1 erect, l_2 and later ones oblique and gradually decreasing depth.

3. Group of P. haradai.....Meso-pachydiscus, nov.

Shell more inflated and umbilicus narrower than in Pseudopachydiscus. Suture-lines: l_2 almost erect. All other features similar to Pseudopachydiscus.

4. Group of P. fascicostatus.....

Anapachydiscus, nov.

Intermediate in form between the third and fifth groups; ribs narrow, crowded and almost straight. Suture-lines as in the fifth group.

5. Group of P. naumanni.....Neopachydiscus, nov.

Considerably increased in inflation of shell and decreased in the breadth of umbilicus; aperture lunate; surface-sculpture as in *Mesopachydiscus*. Suture-lines: similar to *Parapachydiscus* s.s.

6. Group of P. mamiyai.....Epipachydiscus, nov.

Shell like Parapachydiscus s.s. in form and sculpture. Suture-lines: external part as in Pseudopachydiscus, but with l_1 l_2 l_3 erect.

7. Group of P. menu.....Menuites, Spath.

Shell like *Neopachydiscus* in form; surface with distant ribs and two rows of tubercles, one along the umbilical margin and the other along the ventral. Suture-lines: as in *Mesopachydiscus*, but minor incisions all around both the saddle and lobes being deep.

Noteworthy is the gradual transition in outline of shells recognised among the ammonites belonging to the second, third and fourth groups, the shells varying from widely umbilicated, compressed discoidal form of the second group to narrowly umbilicated, much inflated form of the fourth group. Suture-lines show likewise a gradual change, corresponding to that of shells, the relative length of L_1 to (L) increasing and gradually acquiring erect position from the second group through the third to the fourth. The ammonites of the second group being the geologically oldest and these of the fourth the youngest, the morphological changes outlined above are perhaps evolutional, and hence the subdivisions of Parapachydiscus, here proposed, at least partly, may represent mere stages of development in phyletic series. In this sense, Pseudo-, Meso-and Neopachydiscus cannot be regarded as good subgenera in biological sense; but these names are believed certainly to be useful and convenient for stratigraphical purpose.

Dr. Spath's genera, Eupachydiscus, Canadoceras and Novakites,²⁾ seem to cover some of the types here distinguished; but generic diagnosis and especially descriptions of suture-lines are not yet sufficiently given of none of his new genera, and we found great difficulties in applying these names to the Japanese materials at our disposal.

¹⁾ The following symbols are used by us for elements of suture-lines: (L) and (S) for the siphonal lobe and saddle, L_n and S_n for the external lobes and saddles, (l), l_n and s for the lobes and saddles of the inetrnal part of suture-lines, n being numerals representing order of sequence from the siphonal, or antisiphonal, line to the umbilical suture.

²⁾ L.F. Spath: On the Senonian Ammonite Fauna of Pondoland. Trans. R. Soc. South Africa, 10, pt. 3, (1922).